

AINHUM.

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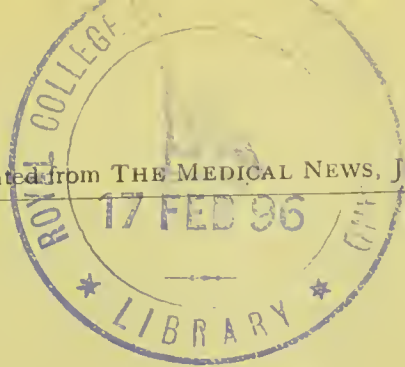
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**AINHUM.<sup>1</sup>**

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AINHUM may be defined as a pathologic process, the ultimate result of which is a spontaneous amputation of the little toe. It is confined almost exclusively to negroes, chiefly males, and of African descent. In Brazil it is called "ainham" or "quigila." "Ainham" literally means to saw, and is doubtless a colloquial name derived from a supposed slow, sawing process. The Hindu name for it is "sukha pakla," meaning dry suppuration.

In 1866, da Silva Lima, of Bahia, at the Misericordia Hospital, gave the first reports of this curious disease, and for quite a period it was supposed to be confined to Brazilian territory. Since then, however, it has been reported from nearly every quarter of the globe. Relative to its geographic distribution I will make a brief summary of reports from different localities:

*South America.* Da Silva Lima and Seixas, of Bahia, have reported numerous cases in Brazil, as have Figueredo, Pereira, Pirovano, Alpin, and Guimares. Toppin reports it in Pernambuco.

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<sup>1</sup> Read before the Pathological Society of Philadelphia, November 8, 1894.

*Egypt.* Mr. Milton reports a case from Cairo, and Dr. Creswell at Suez, both in slaves.

*Trinidad.* E. A. G. Doyle reports several cases at the Fernando Hospital.

*African Coast.* Digby reports its prevalence on the west coast of Africa, particularly among a race of negroes called Krumens. Messum reports it in the South African Republic, and speaks of its prevalence among the Kaffirs. Eyles reports it on the Gold Coast. It has also been seen in Algiers and Madagascar.

*India.* Through the able efforts of Her Majesty's surgeons in India the presence of ainhum has been shown in India, and considerable investigation made as to its etiology, pathologic histology, etc. Wise at Dacca, Smyth and Crombie at Calcutta, Henderson at Bombay, and Warden, Sen, Crawford, and Cooper in other portions of Southern India have all rendered assistance in the investigation of ainhum.

In *China* a case has been seen, and British surgeons speak of it as occurring in *Ceylon*.

*British Guiana.* Von Winckler presents an admirable report of twenty cases at Georgetown.

*St. Thomas.* Dr. Potoppidan sends a report of a case in a negress.

The disease has several times been observed in *Polynesia*.

*North America.* Dr. Hornaday reports a case in a negress from North Carolina, and, curious to relate, O. Horwitz, of Philadelphia, and Shepherd, of Canada, found cases in negroes both of North Carolina antecedents. Dr. James Evans reports a case in a negro, seventy-four years of age, at Darling-

ton, S. C. Dr. R. H. Days, of Baton Rouge, La., had a case in a negress, and Dr. J. L. Deslates, also of Louisiana, reports four cases in St. James Parish. I have seen a case in a negress, aged fifty years, in Washington at the Emergency Hospital.

The foregoing summary shows the universal distribution of the disease, the Arab, Hindu, Mussulman, and even the Mongolian being susceptible as well as the negro.

So prevalent is the disease in India that Crawford found a case in every 2500 surgical cases at the Indian hospitals. The absence of pain or inconvenience in many instances doubtless keeps the number of cases reported few, and again we must take into consideration the fact that the class of persons afflicted with ainhum are seldom brought in contact with medical men.

Ainhum is a much more common disease than has heretofore been supposed, and as such deserves a careful consideration.

The disease usually affects the fifth phalanx at the inter-phalangeal joint. Cases of the fourth and other phalanges have been reported. Cooper speaks of a young Brahmin who lost his left great toe by this process. Crombie speaks of a simultaneous amputation of both fourth toes. Potoppidan reports a similar case in a negress on St. Thomas Island. Sen reports a case in a supernumerary digit in a child, whose father, a Hindu, lost a toe by ainhum. Eyles reports a case in a negro in whom the second finger was affected. Mirault, at Angiers, speaks of a case in which two fingers were lost in fifteen days, a fact which makes his diagnosis dubious. Beranger-

Ferrand has seen all the toes amputated, and there is a wax model by Baretta, Paris, in the Army Medical Museum at Washington, in which all the toes of the right foot have been amputated, and the process is fast making progress at the middle third of the leg.

Ainhum is much more common in males than in females; it is in fact distinctly rare in the latter. Of Von Winckler's twenty cases all were males. It may occur at any age, but is most common between thirty and thirty-five. It has been reported *in utero* by Guyot, and was seen to extend up to the thigh, a statement that is most likely fallacious. However there are well-authenticated cases in infants, and again in persons over seventy years of age.

In some few cases the metatarso-phalangeal joint is affected; but no case has been seen at the base of the ungual phalanx.

The duration of the disease is between two and four years, but Dr. Evans' case had been in progress fifty years. It rarely runs its full course before a year.

Reports conflict as regards the influence of climate on this disease. Wise, at Decca, says it is most common in damp or rainy weather, while Crombie and Smyth, also in India, report cases from the dry highlands associated with goiter. Climate, perhaps, has no influence on it. Dry, hard ground causes more pain in walking, and the dry cold winds, spoken of by Crombie, exert their influence indirectly in this manner.

There is a difference of opinion again regarding the soil favorable for its development. Sandy soil is reported to be a cause, and the Egyptian reports

attribute it to working in salt. Seixas, of Bahia, an authority, says the wearing of boots does not prevent it. Weight-carriers are most affected, particularly on a hard soil, according to some Indian observers. We can, therefore, form no definite conclusion as to the influence of soil outside of the extra pain caused by walking on a hard soil.

*Symptoms.* Ainhum begins as a small furrow or crack, such as soldiers often experience, at the digito-plantar fold, seen first on the inner side. This process of furrowing never advances in soldiers, and has been given a name more expressive than elegant. In ainhum the toe will in a few days swell, and a pain, burning or shooting in nature, may be experienced in the foot and leg affected. Pain, however, is not constant. There may be an erythematous eruption accompanying the swelling. The furrow increases laterally and in depth, and meets on the dorsal aspect of the toe, giving the toe the appearance of being constricted by a piece of fine cord. As the furrow deepens the distal end of the toe becomes ovoid, and soon an appearance as of a marble attached to the toe by a fibrous pedicle presents itself. By this time the swelling, if any, has subsided. The distal end of the toe bends under the foot, and becomes twisted when walking, and causes inconvenience, and, unfortunately, says Eyles, it is in this last stage only that the Fanti presents himself. There is in the majority of cases a small ulcer in or near the digito-plantar fold, which causes most of the pain, particularly when walked on. This ulcer does not occur early, and is not constant. The case under



my observation showed no ulceration, and was absolutely painless, the negress applying for diagnosis rather than treatment. The furrow deepens until spontaneous amputation takes place, which rarely occurs, the patient generally hastening the process by his own operation, or by seeking surgical treatment. A dry scab forms at the furrow, and when picked and repicked constantly re-forms, being composed of horny desquamation or necrosis.

The *histology* of ainhum shows it to be a direct ingrowth of epithelium, with a corresponding depression of surface due to a rapid hyperplasia that pushes down and strangles the papillæ, thus cutting off the blood-supply from the epithelial cells, causing them to undergo a horny change. We are indebted to C. H. Eyles for the best description of the histologic change as observed microscopically.

The disease is not usually symmetrical, as formerly stated, nor is it simultaneous in different toes. There are no associated constitutional symptoms, no tendency to similar morbid changes in other parts, and no infiltration elsewhere. There is little or no edema with ainhum.

Crombie made measurements of the circumference of both the left and right toes in a case of ainhum, as follows: Circumference at bottom of furrow, right,  $1\frac{7}{8}$  inches; left,  $1\frac{1}{4}$  inches. Circumference of distal phalanx, right,  $2\frac{1}{8}$  inches; left,  $2\frac{7}{8}$  inches. This demonstrates the lack of symmetry of the morbid process.

As a rule, sensation is not destroyed, although cases of anesthesia have been reported. There is usually no change in the nail. Weber compares the



appearance of the distal end to a diminutive potato. The dorsal tendon stands out as a white cord, surrounded by a black ring. Eyles made his studies in a section hardened in Müller's fluid, and stained *en masse* in picro-carmin or eosin. The changes resemble somewhat the morbid process seen in lupus. The hypertrophy of the epidermis at the tip approximates one mm. in thickness, while that near the constriction equals 5 mm. in thickness. In the stratum corneum there is seen an hypertrophy of the interpapillary process, which is irregular. In the stratum lucidum the hypertrophy is uniform, and this layer in the posterior portion of the section becomes fused into the layer above. Instead of the characteristic appearance of an indistinct layer of two or three cells deep, we see a layer of distinct cells twelve or fifteen deep.

Hypertrophic change is seen in the stratum granulosum also. In the stratum malpighii, anteriorly, while the interpapillary processes increase in all dimensions, slender processes, composed of double columns of closely-apposed pigmented (germinal) epithelium are seen which pass down, splitting the papilla. As the stage of separation advances these processes, which are formed by the evolution of the germinal layer covering the top of the papilla, give off shoots that coalesce with shoots of adjacent processes, and a network is formed, the trabeculae of which consist of double layers of pigment-cells. Eyles describes the appearance on transverse section as a sheet of more or less typical prickly-cells, which is perforated by round or oval islets of papillary material, each islet being surrounded by a single

layer of pigmented epithelium. Posteriorly, the entire thickness resembles the stratum corneum; the only foreign representative is a layer of pigment-cells, which may take the form of dim processes or form a small network. As to dermal or sub-dermal changes, there is seen a hyperplasia of fibrous tissue, subsequent to chronic inflammation. As concerns vascular changes, the larger arteries show an increase in adventitia, but little change in the muscular coat, though proliferation of connective-tissue elements may increase it. The intima is subject to a process similar to an endarteritis obliterans, which decreases or obliterates the lumen. As the vessels become smaller or capillary they are surrounded, if anteriorly, by a small round-cell infiltration, or, if posteriorly, by fibrous tissue. The section of the specimen can thus be distinguished. The capillary loops undergo a hyaline change, and there is fusion of the endothelial plates. In the veins the adventitia and endothelium are swollen. As to glandular changes, Eyles' observation showed a thickening occasionally of the membrana propria by the addition of white fibrous tissue. There may be fatty change in the distal end of the coil, and the lumen becomes less.

The osseous changes consist in a rarefying osteitis, which advances regularly from the periosteum, but irregularly toward the center. There is little attempt at new bone-formation, and cavities are formed which eventually become filled with a reticulum of delicate fibrous tissue, capillaries, and oil-globules. There is a gradual conversion into fibrous tissue.

Eyles made little or no observation of nerve-changes; but there is doubtless a process identical with that seen in neuritis of any duration.

The similarity to epithelioma is seen by the foregoing description; but there is no infiltration or epithelial hyperplasia at the side or in the vicinity of the furrow, this being confined to the deepest portion.

In *ainhum* there is, first, simple hypertrophy, then active hyperplasia. The papillæ are pushed down and deprived of blood supply, and undergo horny change. Meanwhile the pressure thus exerted on the *nervivascularum* sets up vascular changes which bring about epithelial changes in more distant areas, the process advancing anteriorly, that is, in the direction of the arteries. This makes the cause, according to Eyles, an inflammatory and trophic phenomenon due mainly to changes following pressure on the vasomotor nerves.

*Etiology.* The theories of the causation of *ainhum* are quite numerous, and I will take them up individually.

The influence of soil and climate has already been discussed

The first cause is the admirable location for a furrow in the digito-plantar fold, and the excellent situation of the furrow for the entrance of sand or other particles to make the irritation constant, thus causing chronic inflammatory changes, which are followed subsequently by the changes peculiar to *ainhum*.

The cause has been ascribed to the practice of wearing rings on the toes; but von Winckler says

that in his locality (British Guinea) this practice is confined to the coolie women, and in not one of his twenty cases had a ring been previously worn on the toe; in fact, all of the patients were males. Digby says, however, that the Krumens, among whom the disease is common, have long worn brass or copper rings on the fifth toe. Again, the natives of India, who are among those most frequently afflicted, have no such custom.

Injury, such as stone-bruise, has been attributed as the initial cause, and well-authenticated cases have been reported in which traumatism is distinctly remembered; but Smyth, Weber, and several other observers deny that habits, accidents, or work, are a feature in causation. The case I saw gave no history of traumatism.

The American observers of most recent date advance the theory of pathogenic organisms; but the immunity of people not dark-skinned seems to contradict this, together with the fact that there is no history of contagion in *ainhum*. Collas says the disease is amputating leprosy, but the fact of its being localized and the absence of constitutional symptoms contradict this theory. The affection has been called *pityriasis Ethiopium* and *scleroderma annulare*. Frontau denies its existence as a distinct disease.

To summarize, none of the theories advanced bears discussion but that of Eyles, and, from my own observation of the process, there is pressure of the hypertrophied fibrous tissue subsequent to continued irritation on the vaso-motor nerves, to which pressure the peculiar morbid changes of *ainhum*

are due. It is really a tropho-neurosis. Heredity seems to exert little influence.

The diagnosis is easy. No other disease resembles it. Gangrene is distinctly different. In frost-bite there is a history of cold, and this affection is of short duration.

The absence of constitutional symptoms and its limited field of occurrence distinguish ainhum from leprosy and from elephantiasis.

I have compiled a list of all the existing literature of the subject in the Surgeon-General's Library at Washington, and herewith append it.

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